LIFTING COLUMN FOR A MEDICAL EXAMINATION TABLE

Background of the Invention

The present invention relates to medical examination tables and, more specifically, to adjustable columns for examination tables.

Adjustable tables have been previously used in the medical fields. Generally, the focus of prior table adjustment has been for angular or rotational displacement of the table bed. That is, the table base remains stationary while mechanical or hydraulic means tilt or angle the bed in other directions. Though these designs assist an examiner in repositioning a patient for different procedures, they do not allow for vertical mobility of the table. For instance, if a patient were to be moved from a wheelchair or a low resting gurney, such table would still need the patient to be lifted onto the table.

Previous inventions have contemplated adjustable bases. For instance, Schnelle et al. (U.S. Patent No. 4,589,642), discloses an adjustable base that uses hydraulic cylinders moving in opposite directions to adjust the base height. However, the hydraulic operating unit is mounted on the top of the cylinders, which increases the minimum height the cylinder may attain. Likewise, the placement of the unit provides for a louder

operating unit than desired. Also, though compact, the base does not provide for the easiest access to all of the parts, if such parts require servicing. Thus, a compact, quiet, easily accessible base is contemplated.

Summary of the Invention

The present invention provides an adjustable column for an examination table that is compact, efficient, and may be easily serviced if necessary. The column is designed to minimize the space needed for the column while still providing sufficient, sturdy support for a patient resting upon the examination table. Also, the column is designed so that the column height is adaptable over a wider range of heights than possible with the prior art. Likewise, the minimum height of the column is less than previous minimum heights attainable by similar examination tables of the prior art.

The column consists generally of three sleeve sections or members that are telescopingly related to one another. The first sleeve section is secured to the base of the table, with the second sleeve section slidingly connected to the first sleeve section. A third sleeve section is slidingly connected to the second sleeve section and attached to the table bed.

The three sleeve sections are designed so that each successive sleeve section nestingly fits around the previous sleeve section. Preferably, the first sleeve section has the smallest perimeter and the following sleeve sections have increasingly larger perimeters. The sleeve sections form a generally rectangular shape, with the sleeve sections formed by joining together two overlapping U-shaped sleeve sections of material.

The sleeve sections are moved upward and downward by a pair of actuators, one located within the column sleeve sections and one located on the outside of the column sleeve sections. The inside actuator controls

movement of the second sleeve section with respect to the first sleeve section. The outside actuator is attached at the bottom of the second sleeve section and the top of the third sleeve section so that the two sleeve sections may be moved simultaneously. The column may be designed having both the actuators located inside of the column, or both actuators may be located outside of the column.

The sleeve sections of the column move relative to one another by guide rails and cam followers located on opposing sides of the column sleeve sections. The guide rails are longitudinally extending with a pair of oppositely disposed parallel guide surfaces. The guide rails are located between the first and second sleeve sections, and the second and third sleeve sections, with accompanying cam followers for each rail. The rails are mounted on the outside and inside of the second sleeve section, and the cam followers have an eccentric diameter for adjustment against the rails. The cam followers are oppositely disposed and spaced apart and are in guiding contact with an oppositely respective disposed parallel guide surface of the guide rail. The design allows for smooth upward and downward movement of the column as well as support for heavier patients without diminishing the effectiveness of the column.

The design of the column allows easy access for maintenance, as well. Because the rail and cam followers inside the columns may be easily accessed through the top of the column without complicated disassembly of the column, a person may service the column in a quick and efficient manner.

Brief Description of the Drawings

Figure 1 is a perspective view of an examination table with the base in an extended position employing the present invention.

Figure 2 is a perspective view of an

examination table with the base in a retracted position employing the present invention.

Figure 3 is a perspective view of the present invention in an extended position.

Figure 4 is an overhead view of the present invention.

Figure 5 is an overhead view of the present invention containing an actuator inside of the present invention.

Figure 6 is a sleeve sectional perspective side view of the present invention showing the guide means of the present invention.

Figure 7 is a close-up view of the guide means of the present invention.

Figure 8 is a close-up sleeve sectional view of the body of the present invention.

Figure 9 is a close-up perspective view of an actuator used in the present invention.

Figure 10 is a cut-away perspective view of the view shown in Figure 5.

Figure 11 is a perspective view of an alternate column.

Description of the Preferred Embodiment

Although the disclosure hereof is detailed and exact to enable those skilled in the art to practice the invention, the physical embodiments herein disclosed merely exemplify the invention which may be embodied in other specific structure. While the preferred embodiment has been described, the details may be changed without departing from the invention, which is defined by the claims.

Figure 1 is a perspective view of an examination table 10. The table generally comprises a support bracket 12, a support column 14, and a base 16. The focus of the present invention is on the support

column 14 and the adjustable nature of the column 14. The column 14 generally comprises three sleeve sections or members: a first or lower sleeve section 18, a second or middle sleeve section 20, and a third or upper sleeve section 22. The first sleeve section 18 is attached to the base 16, the second sleeve section 20 is attached to the first sleeve section 18 and the third sleeve section 22, and the third sleeve section 22 is attached to the support bracket 12 of the table 10. The third sleeve section 22 may be attached to the support bracket 12 in any sufficient manner that will secure the column 14 to the support bracket 12.

Figure 2 shows the table 10 with support column 14 in a retracted position. The third sleeve section 22 slides nestingly downward over the second sleeve section 20 (not shown), which slides nestingly downward over the first sleeve section 18 (not shown). The height of the column 14 may be adjusted significantly. As shown in Figure 1, the table is extended to a height of about 42 inches, which is the typical or normal height of an examination table. The present invention allows the column 14 to be compressed to a minimum height less than 20 inches, or approximately 19 inches, which facilitates transportation and movement of patients who may need to be moved from a wheelchair or other similarly shorter object. Previous designed prior art columns have been known to have a lowest height of only 22 inches, and a column range of only 18 inches. The three sleeve sections are arranged so that the diameters of the sleeve sections decrease from the third sleeve section 22 to the first sleeve section 18, thereby preventing a sleeve section from interfering with the movement of an adjacent sleeve section. Similarly, the sleeve sections may be designed so that the diameters increase as oppose to decrease from the third sleeve

section 22 to the first sleeve section 18. Likewise it should be understood that the invention is adaptable for use with more or fewer sleeve sections, depending on personal needs or preferences.

Referring to Figure 3, a perspective view of the support column 14 is shown without an outer casing. A longitudinally extending guide rail or camming guide rail 24 is attached to each of the surfaces 26 of the second sleeve section 20, preferably axially aligned with the center of each of the surfaces 26. The guide rail 24 is securely attached to the second sleeve section 20 and comprises guide means for movement of the column 14. The guide rail 24 may be attached with any known means, such as nuts and bolts, rivets, or screws, that will not interfere with the function of the guide rail 24. Preferably, each side of the second sleeve section 20 has a rail 24 attached to each side, centrally aligned on each side. Such an arrangement provides for smooth movement of the column 14 upwards and downwards and contributes to the stability of the column 14.

Figure 4 shows an overhead view of the column 14. The first sleeve section 18 is shown nesting evenly within the second sleeve section 20, which nests evenly within the third section 22. As mentioned above, the rails 24 are located on the outside center of the surfaces or walls 26 of the second sleeve section 20. Also, a second set of rails 28 are located on the inside center of the walls 26. The outside rails 24 and the inside rails 28 are manufactured and designed in the same way and perform similar guide functions. The outside rails 28 guide the movement of the second sleeve section 20 with respect to the third sleeve section 22, and the inside rails 28 guide the movement of the second sleeve section 20 with respect to the first sleeve section 18. To further assist the guide rails 24 and 28 in guiding

the sleeve sections, a plurality of cam followers 30 are situated along the rails 24 and 28. The interaction of the guide rails 24 and 28 and the cam followers 30 allow the sections to be spaced apart in a generally uniform fashion. The actual function and movement of the cam followers 30 will be described in more detail with respect to Figures 6 and 8.

Still referring to Figure 4, the first sleeve section 18 comprises a plurality of inwardly facing lips 32 corresponding to each side of the first sleeve section 18. The lips 32 allow the first sleeve section 18 to be secured to a bracket 17, which will in turn be secured to the base 16 (not shown). Any suitable means, such as screws, bolts, rivets, or other securing devices, may be used to secure the first sleeve section 18 to the bracket 17 and, also, to the base 16. Likewise, instead of lips 32, other devices, such as braces or struts, may aid in attaching the column 14 to the base. The first sleeve section 18 and the base 16 could also be connected mechanically, by welding, with an adhesive, or with any other suitable means.

Figure 5 shows the same overhead view as shown in Figure 4 except with the inclusion of an actuator 34 within the column 14 and a second actuator 35 is attached to the outside of the column 14. The actuator 34 is secured to the bracket 17 by any fastening means as described above regarding the first sleeve section 18. The actuator 34 is arranged within the column 14 in such a manner to minimize the amount of overall space and area needed for the column 14. Also, the actuator 34 is positioned so that it will not interfere with the movement of the sleeve sections relative to one another.

Referring to Figure 10, a perspective cut-away sectional view of the actuator 34 and the column 14 is shown. The bracket 17 is secured to the lips 32 of the

first sleeve section 18, which is then secured to the base 16. A second set of fasteners 19 is used to secure the first sleeve section 18 to the base 16 without any connection to the actuator 34 or the bracket 17. It should be noted that the actuator 34 may be secured to the base 16 with the same fasteners that secure the first sleeve section 18 to the base 16, as described above with respect to Figure 4, thereby minimizing the number of fasteners needed to secure the column 14 to the base 16. However, such an arrangement would lead to an unstable column 14 if the actuator 34 were to be removed from the column 14 for any purpose.

Figure 6 shows a side view of the column 14. The guide rail 24 is shown centrally located on the second sleeve section 20 with the cam followers 30 in contact with the guide rail 24. The cam followers 30 are shown in phantom as they are located on the inside surface of the third sleeve section 22. The guide rail 24 longitudinally extends the length of the surface 26 of the second sleeve section 20. The guide rail 24 has a pair of oppositely disposed parallel guide surface 44, which provide an area for the cam followers 30 to be in guiding contact with the guide rail 24. The cam followers 30 are preferably placed parallel from one another across the guide rail 24, with one of the cam followers 30 each in contact with one of the guide surfaces 44. A second set of the cam followers 30 are spaced laterally from the first cam followers 30. Such an arrangement provides stability and strength for the column to support heavier patients, including patients up to at least 450 pounds (204 kilograms), even if the patient is located in a cantilevered position on the table. Such a cantilevered position may take place if a patient were to kneel on an end of the table 10. The cam followers 30 are also arranged to rest only on the rails

24 or 28 and not the sleeve sections 18, 20, or 22 of the column (see Figures 4 and 5), thereby lessening the stress of the parts of the column 14 as it moves upwardly and downwardly. The actuator 35 is attached to the bottom of the second sleeve section 20.

Figure 7 shows the cam follower 30 in more detail. The cam follower 30 is comprised of an inner rotating shaft 40 and an outer rolling sleeve section 42. The inner rotating shaft 40 will be secured to the column sleeve sections 18 and 22 (see Figures 4 and 5) by a threaded section 43, while the outer rolling sleeve section 42 will make contact with the rails 24 and 28 (See Figures 4, 5, and 6). The inner rotating shaft 40 is eccentric with the outer rolling sleeve section 42 to allow for alignment adjustment of the cam follower 30 against the rails 24 and 28. The outer rolling sleeve section 42 preferably, but not essentially, has a slight crown (~12 inch radius) to further align the cam followers 30 with the rails 24 and 28. While the threaded section 43 is used to attach the cam followers 30 to the column 14, any suitable attaching means may be used, providing the outer section 42 is still allowed to rotate. When the sleeve sections 18, 20, and 22 are moved relative to one another, the eccentric design of the cam follower 30 allows the sections 18, 20, and 22 to move in an axially aligned manner with one another. When traveling up and down the guide rails 24 and 28, the cam follower 30 design will allow for slight side-to-side movement to keep the sections 18, 20, and 22 essentially aligned.

Now referring to Figure 8, the design of the separate column sleeve sections 18, 20 and 22 is discussed. The three sleeve sections, though having different dimensions are designed in the same manner. The holes for the guide rails 24 and 28 and the cam

followers 30 are not shown in this Figure. A large U-shaped portion 36 and a small U-shaped portion 38 are combined to form each of the respective sleeve sections. The two portions 36 and 38 are secured together with conventional fasteners, such as nuts and bolts, to form a generally rectangular shape. The sections 36 and 38 may also be combined by welding, adhesives, or other means that will allow the column 14 to keep its predetermined shape. Using different sized portions 36 and 38 prevents interference of the securing area to with the rails 24 and 28 and the cam followers 30 (see Figures 4 and 5), and also makes it easier to accurately shape the sections.

Likewise, the column 14 could be designed to have more or fewer sections to make the sleeve sections, for instance the U sections 36 and 38 divided each into two corner sections. The sleeve sections 18, 20, and 22 should be interpreted broadly. Any nesting sections will fall within the scope of the sections described. Thus, the specific sections do not have to be of a closed polygonal shape, but may have an open side or open sides, providing that the specific section nests with the adjoining sleeve section or sections.

As an example, Figure 11 shows a perspective view of a different embodiment of the first and second sleeve sections 18 and 20. The first sleeve section 18 may be designed as a solid section with the second sleeve section 20 surrounding it as a C-shaped. The rail 28 and cam followers 30 (shown in phantom) would ride between the two sections 18 and 20 in a similar fashion as previously described. Even though the sections are not enclosed polygonal shapes, they would fall within the scope of this invention as forming nesting sleeve sections.

A perspective view of the actuator 34 is shown

in Figure 9. The actuator 34 is a linear actuator of a standard design known in the field of invention. The actuator 34 is comprised of three general parts: a piston 46, a piston housing 48, and a motor 50. The preferred embodiment employs two actuators 34 and 35, one actuator 34 located within sleeve sections (see Figure 5), and one 35 located outside of the sleeve sections (see Figure 3). The inside actuator 34 and the outside actuators 35 are of the same design and perform the same general functions of raising and lowering the column 14. The outside actuator is attached to the bottom of the second sleeve section 20 and the top of the third sleeve section 22 to allow both sections 20 and 22 to move at the same time. The inside actuator is attached to the bracket 17 at the same place where the first sleeve section 18 is attached to the bracket 17 (see Figures 4 and 5). The inside actuator controls relative movement of the second sleeve section 20 to the first sleeve section 18. In Figure 3, a third actuator, shown in phantom, is not considered part of the invention.

The column 14 will operate most efficiently if the rails 24 and 28 are aligned along the center of the surfaces 26 (see Figure 4) and preferably aligned with one another. The rails 24 and 28 are preferably made from a hardened to steel to prevent undue wear. Similarly, it is preferred that a rail and cam follower combination is present at each pair of facing surfaces, but the column will operate if such an arrangement is not present.

The columns 14 are shown to be rectangular in shape. However, the sleeve sections may be of any shape, provided that they having nesting surfaces so that the guide rails and the cam followers may interact. Also, the columns may not necessarily be of the same shape. For instance, a column may have an octagonal shape, while

another may be rectangular, and the column would still fall within the scope of the invention.

The guide rails 24 and 28 are shown as being attached or secured to the column 14 sections. The term secured should be interpreted broadly to encompass any arrangement that will hold the guide rails 24 and 28 relatively connected. For instance, the guide rails may be welded or adhered to the sections. Likewise, the guide rails may be integrally formed as a section of one of the sections, which would still fall within the definition of secured as used in the specification. Provided a guide rail is connected to one of the sections in any fashion, integrally or separately, it will fall within the definition of secured as used herein.

The foregoing is considered as illustrative only of the principles of the invention. Furthermore, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described. While the preferred embodiment has been described, the details may be changed without departing from the invention, which is defined by the claims.